

CLAIMS

1. A magnetoresistive spin-valve sensor comprising:

- 5       a magnetic layer;  
      a specular layer made of a metal oxide;  
      a back layer, made of Au, Cu, AuCu, AgCu, AuAgCu or an alloy thereof, interposed between the magnetic layer and the specular layer; and  
10       a metal layer disposed adjacent to the specular layer, opposite to the back layer, and made of a metal which improves GMR performance of the magnetoresistive spin-valve sensor.

15       2. The magnetoresistive spin-valve sensor as claimed in claim 1, wherein the specular layer is made of a material selected from a group of CoO, Co<sub>3</sub>O<sub>4</sub>, Co<sub>2</sub>O<sub>3</sub>, Cu<sub>2</sub>O, CuO, Al<sub>2</sub>O<sub>3</sub>, NiO, FeO, Fe<sub>2</sub>O<sub>3</sub>, MnO, TiO<sub>2</sub> and alloys thereof.

20       3. The magnetoresistive spin-valve sensor as claimed in claim 1 or 2, wherein the metal layer is made of a material selected from a group of Ta, Ru, Ni, Fe, Pd, Pt, Mn, Cu, Co, Ti, V, Cr, Zn, Y, Zr, Nb, Mo, Rh, Ag, Au, Hf, W, Re, Os, Ir, Nb and alloys thereof.

      4. The magnetoresistive spin-valve sensor as claimed in any of claims 1 to 3, wherein the  
30       magnetic layer has an effective magnetic layer thickness, excluding a thickness of a magnetically dead layer, greater than 0 and less than approximately 40 Å.

35       5. The magnetoresistive spin-valve sensor as claimed in any of claims 1 to 4, wherein the back layer has a thickness of approximately 20 Å or less.

6. The magnetoresistive spin-valve sensor as claimed in any of claims 1 to 5, wherein the back layer is made of a  $Au_{1-x}Cu_x$  alloy, where  $x$  denotes a fraction of Cu in the alloy greater than 0.0 and less than 1.0.

7. The magnetoresistive spin-valve sensor as claimed in any of claims 1 to 5, wherein the back layer is made of a  $Ag_{1-x}Cu_x$  alloy, where  $x$  denotes a fraction of Cu in the alloy greater than 0.0 and less than 1.0.

8. The magnetoresistive spin-valve sensor as claimed in any of claims 1 to 5, wherein the back layer is made of a  $Au_{1-x-y}Ag_yCu_x$  alloy, where  $x$  denotes a fraction of Cu in the alloy,  $y$  denotes a fraction of Ag in the alloy, and  $x$  and  $y$  respectively are greater than 0.0 and less than 1.0 so that  $x+y$  is less than 1.0.

9. The magnetoresistive spin-valve sensor as claimed in any of claims 1 to 8, wherein the magnetic layer forms a free layer, and further comprising:

another magnetic layer which forms a pinned layer; and

a spacer layer interposed between the two magnetic layers.

10. A magnetic storage apparatus for reading information from a magnetic recording medium, comprising:

a magnetoresistive spin-valve sensor which reads the information from the magnetic recording medium,

said magnetoresistive spin-valve sensor comprising:

a magnetic layer;

a specular layer made of a metal oxide;

a back layer, made of Au, Cu, AuCu, AgCu, AuAgCu or an alloy thereof, interposed between the

5 magnetic layer and the specular layer; and

a metal layer disposed adjacent to the specular layer, opposite to the back layer, and made of a metal which improves GMR performance of the magnetoresistive spin-valve sensor.

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